AD-A104 668 ARMY ENGINEER DISTRICT ST LOUIS MO F/G 13/13
NATIONAL DAM SAFETY PROGRAM. HICKORY HILLS GOLF CLUB DAM (NO NA--ETC(U)
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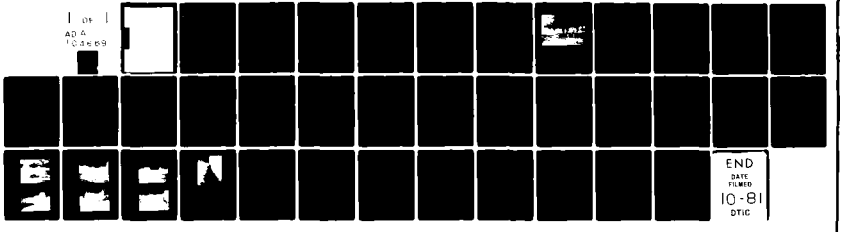

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Approved for release; distribution unlimited.

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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety, Lake, Dam Inspection, Private Dams

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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JOACHIM CREEK BASIN

HICKORY HILLS GOLF CLUB LAKE DAM (NO NAME NO. 235)
JEFFERSON COUNTY, MISSOURI

MISSOURI INVENTORY NO. 30403

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY: ST. LOUIS DISTRICT CORPS OF ENGINEERS
FOR: GOVERNOR OF MISSOURI

SEPTEMBER 1978

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam	No Name No. 235, Hickory Hills Golf Club Dam
State Located	Missouri
County Located	Jefferson
Stream	Unnamed Tributary to Joachim Creek
Date of Inspection	6 September 1978

No Name No. 235, Hickory Hills Golf Club Dam No. Mo. 30403 was inspected using the "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed by the Chief of Engineers, U. S. Army, Washington, D. C., with the help of Federal and state agencies, professional engineering organizations, and private engineers. The resulting guidelines are considered to represent a consensus of the engineering profession.

Based on the criteria in the guidelines, the dam is in the high hazard potential classification, which means that loss of life and appreciable property loss could occur in the event of failure of the dam. Six houses, two improved roads, a shopping center and a railroad bridge (Missouri Pacific Railroad) would be subjected to flooding with possible damage and/or destruction and possible loss of life. No Name No. 235 Dam is in the small size classification since it is greater than 25 feet high but less than 40 feet high.

The inspection and evaluation indicate that the spillway of Lake No Name 235 does not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. Lake No Name 235 is a small size dam with a high hazard potential required by the guidelines to pass from one-half PMF to the PMF. Considering the high hazard potential to loss of life and property downstream of the dam, the outlet facilities of No Name 235 should be able to pass the PMF without overtopping the dam. However, it was determined that the spillway will only pass 10 percent of the PMF without overtopping the dam.

Since the outlet facilities for Lake No Name 235 are not capable of passing a minimum of one-half (50 percent) of the PMF without overtopping the dam and causing failure, the spillway is considered seriously inadequate and the dam is accordingly classified as an unsafe, non-emergency structure.

The evaluation of No Name 235 also indicated that the spillway will not pass the 100-year flood; that is, a flood having a 1 percent chance of being equalled or exceeded during any given year.

Other deficiencies visually observed by the inspection team were steep slopes; the need for removal of brush and trees on the dam; seepage and marshy condition on the downstream slope, lack of erosion protection on the dam (except for large trees growing on the upstream slope); and lack of erosion protection on the spillway. The size and extent of vegetation, combined with the steep slopes, are such that remedial measures should be attempted only under the direction of an experienced engineer to avoid creating an unsafe condition. The lack of stability and seepage analyses on record is a deficiency that should be corrected.

It is recommended that the owner take action to correct or control the deficiencies described.

Thomas F. Wolff
THOMAS F. WOLFF
Soils Engineer
St. Louis District
Corps of Engineers

James T. Lovelace
for DENNIS A WOODRUFF
Hydraulic Engineer
St. Louis District
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CHIEN H. HSIEH
Hydraulic Engineer
St. Louis District
Corps of Engineers

SUBMITTED BY: [signature]
Chief, Engineering Division — 26 Sept 78
Date

APPROVED BY: [signature]
Colonel, CE, District Engineer — 26 Sep 1978
Date

HICKORY HILLS COUNTRY CLUB DAM -
LAKE OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NO NAME NO. 235 DAM - ID NO. 30403

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NATIONAL DAM SAFETY PROGRAM
NO NAME NO. 235 DAM - ID NO. 30403

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of the No Name No. 235 Dam be made.

b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed with the help of several Federal agencies and many state agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) The Hickory Hills Dam is an earth fill dam.

(2) The spillway, located on the left abutment, consists of a horizontal 12-inch diameter, cast iron, overflow pipe. The pipe is 6 feet long and is the primary means of discharge for low flows. An emergency spillway, located at the top of the pipe, consists essentially of low ground approximately 20 feet wide. No controls were found for regulating higher flows. No low level outlet was found. Three retention ponds (abandoned sewage lagoons) are immediately downstream.

b. Location: Section 33, Township 40 North, Range 4 East.

c. Size Classification: Small.

d. Hazard Classification: High

e. Ownership. Hickory Hills Golf Club, DeSoto, Missouri

f. Purpose of Dam. Water hazard for golf course and water supply for watering greens.

g. Design and Construction History. The dam was built in the mid-1960's. No preconstruction design information or detailed construction data are known to exist.

h. Normal Operating Procedure. No operating records exist. Outflow passes over an uncontrolled spillway.

1.3 PERTINENT DATA

a. Drainage Area - 30 acres
26 acres (Topographic Quadrangle, 1960)

b. Discharge at Damsite.

(1) Horizontal overflow pipe - flowing full - 2.4 cfs.

(2) Emergency spillway - Estimated experienced maximum flood - approximately 1 foot above overflow pipe.

c. Elevation (Feet Above M.S.L.).1/

(1) Top of dam - 680.0 ± (Existing)

(2) Invert of overflow pipe at spillway - 678.9

(3) Spillway crest - 678.9 ± (Existing)

(4) Streambed at Centerline of Dam - 658.3 ±

(5) Downstream Elevation of Water Surface in Abandoned Sewage Lagoons/Ponds -

a. Pond No. 1 - 659.49

b. Pond No. 2 - 658.30

c. Pond No. 3 - 659.24

1/ Elevations based on arbitrary reference datum of 680.0 feet msl at Station 0+00.

d. Reservoir. Length of maximum pool - 500 ± feet (1960 Topo maps)

e. Storage.

(1) Normal - 19 acre-feet

(2) Maximum - 24 acre-feet

f. Reservoir Surface Area (Acres).

(1) Top of dam - 2.76

(2) Spillway crest - 2.75

(3) Invert of horizontal overflow pipe - 2.75

g. Dam.

Type - earth fill.

Length - 385 ± feet.

Height - 25.0 ± feet 1/

Top width - 10 ± feet.

Side Slope -

(a) Downstream: 1V on 1H

(b) Upstream: Unknown

Zoning - unknown.

Impervious Core - unknown.

Cutoff - unknown.

h. Emergency Spillway.

(1) Type - Uncontrolled horizontal 12-inch diameter cast iron pipe.

(2) Pipe length - 6 ± feet

(3) Invert of pipe at lakeside: 678.9 ± feet msl.

(4) Crest Elevation: 678.9 ± feet msl.

1/ Height from top of dam to toe located beneath abandoned downstream sewage lagoon.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN.

No design drawings or data are known to exist.

2.2 CONSTRUCTION. The dam was constructed in the mid-1960's. No detailed information was found to be available.

2.3 OPERATION.

No operating records exist.

2.4 EVALUATION.

a. Availability. There are no engineering data available.

b. Adequacy. The field surveys and visual inspections presented herein are considered adequate to support the conclusion of this report. Seepage and stability analyses comparable to the requirements of the guidelines are not on record. This is a deficiency which should be rectified.

c. Validity. Not Applicable.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. The country club manager met briefly with the team during the inspection. The lake serves as a water hazard for the golf course in which it is located. Three abandoned sewage lagoons are present adjacent to the downstream toe of the dam.

b. Project Geology. The reservoir area is characterized by residual brown and red sandy plastic clays. No rock outcrops were observed. The underlying bedrock is mapped as sedimentary rocks of Ordovician Age, Jefferson City and/or Roubidoux formations.

c. Dam. The dam is extremely overgrown with vegetation. Large willows are present along the entire upstream face; the downstream face is covered with trees, thick brush, and vines. The crown is bare earth and is used as a golf cart path.

No detrimental settlement, depressions, cracking, sinkholes, erosion, animal burrows, or slope instability was observed in or near the embankment. However, such features could be present under the vegetation and not visible. The 1V on 1H slope measured on the downstream slope is excessively steep and long-term stability cannot be assured.

Seepage and marshy conditions were observed over extensive areas at and below the dam toe. Downstream of the right abutment and downstream of the dam near the left abutment were large (over 100 feet square) marshes covered with cattails. At one location which could be reached through the brush, the embankment was soft and wet a few feet above the toe of the dam, indicating through-seepage. No concentrations of seepage were noted but slow oozing of water was occurring over the general area. Inspection of the outlet ditch downstream of the sewage lagoons disclosed small but perceptible flow.

The dam has very little (less than 2 feet) of freeboard and no riprap or other wave erosion protection on the upstream face. The thick vegetation presently provide some erosion protection.

d. Appurtenant Structures. The spillway consists of a shallow swale in the left abutment with a 12-inch steel pipe underneath. No erosion protection is provided. A pump in the lake near the dam was found to provide water for adjacent golf greens. A small depression in the dam crown revealed a broken 2-inch plastic

pipe just below the surface which is apparently part of the green watering system. No other appurtenant structures are a part of this dam.

e. Reservoir Area. No pertinent problems were noted in the reservoir area except that, being a golf course, the watershed consists mainly of short, mowed grass, allowing very rapid storm runoff.

f. Downstream Channels. Flow from the spillway swale generally flows across a broad fairway. Except for a small (2 foot ±) ravine, no exit channel exists.

3.2 EVALUATION. The extremely dense vegetative cover made a thorough inspection impractical. The vegetation is a potential seepage hazard and encourages animal burrows. Burrows and other deficiencies may be present and not visible. Although no slope instability was detected, the downstream slope is excessively steep and its long-term stability cannot be assured. Existing seepage and marshy condition, if left uncontrolled, may adversely affect the stability of the dam. Erosion resistance of the upstream face of the dam would be inadequate if vegetation were removed as recommended. The spillway has inadequate erosion resistance for sustained flows. All of the above are deficiencies which should be corrected; however, vegetative growth is of such size and extent that removal should be attempted only under the direction of and with observation by, an engineer experienced in the design and construction of dams. Indiscriminate clearing could create an unsafe condition.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES.

The spillway is uncontrolled; therefore, no regulating procedures exist for this structure.

4.2 MAINTENANCE OF DAM.

The dam embankment is poorly maintained if maintained at all.

4.3 MAINTENANCE OF OPERATING FACILITIES.

Not applicable.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT.

The inspection team is not aware of any existing warning system for this dam.

4.5 EVALUATION.

The large trees on the dam, brush, seepage, and marshy conditions are serious deficiencies which should be corrected; however, these should only be accomplished under the direction of an experienced engineer to avoid creating an unsafe condition.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES.

a. Design Data. There were no hydraulic and hydrological design data available as discussed in Section 2.

b. Experience Data. The drainage area was developed using USGS Quadrangle sheet. The lake surface area was determined by planimetering on Orthophotoquad sheet by the USGS (1975). Surface area-elevations curves were determined by planimetering various contour lines within the drainage area on the USGS Quadrangle sheets. The spillway and dam layout was made from surveys conducted by the inspecting team.

c. Visual Observations. The spillway in the left abutment consists of a horizontal overflow pipe overlaid with gravel to act as an access road to the top of the dam. The width of the spillway is approximately 20 feet.

d. Overtopping Potential.

The emergency spillway for No Name No. 235 has been found inadequate to pass the Probable Maximum Flood (PMF), one-half PMF or the 1 percent chance flood without overtopping. The probable maximum flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The spillway will pass approximately 10 percent of the PMF without overtopping. For the PMF and one-half PMF, the dam would be overtopped 0.8 feet and 0.5 feet for 11.1 hours and 6.8 hours with a discharge of 600 cfs and 300 cfs, respectively.

The effect from rupture of the dam could extend approximately one mile downstream of the dam. There are several homes and the incorporated area of DeSoto, Missouri downstream of the dam which could be severely damaged, and lives lost, should failure occur.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY.

a. Visual Observations. Visual observations which adversely affect the structural stability of this dam are discussed in Section 3.

b. Design and Construction Data. No design or construction data relating to the structural stability of the dam were found.

c. Operating Records. No appurtenant structures requiring operation exist at this dam. Seepage and stability analyses comparable to the requirements of the guidelines are not on record. This is a deficiency which should be rectified.

d. Post Construction Changes. No post-construction changes are known or apparent.

e. Seismic Stability. The dam is in seismic zone 2, to which the guidelines assign a "moderate" damage potential. The low height and clayey materials of this dam minimize the likelihood of failure due to earthquake.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT.

a. Safety. Several items are deficient which should be corrected. These items are steep slopes (1V on 1H), vegetative cover, seepage, insufficient erosion protection for the dam and spillway, and inadequate spillway capacity.

b. Adequacy of Information. Lack of stability and seepage analysis as recommended by the guidelines is a deficiency which should be corrected.

c. Urgency. The deficiencies described herein are serious and corrective actions listed below should be initiated in the very near future.

d. Need for Phase II. No Phase II inspection is recommended. Action should be initiated on the remedial measures recommended.

7.2 REMEDIAL MEASURES.

The following remedial measures are recommended:

a. Remove trees, brush and vines on the embankment. However, growth is of such size and magnitude that this and all following actions should be done only under the direction of an engineer experienced in the design and construction of dams. Indiscriminate clearing could create an unsafe condition.

b. After clearing the dam, further inspection should be made.

c. Fill any animal burrows found during clearing and establish a turf cover.

d. Provide an erosion resistant upstream face and/or increase freeboard.

e. Spillway capacity and/or height of the dam should be increased to pass 50 percent of the Probable Maximum Flood.

f. Erosion protection for the spillway should be provided.

g. Seepage should be stopped or controlled to allow drainage and pressure relief in a safe manner. Seepage control works should be based on appropriate seepage analysis.

h. The dam should be periodically inspected by an experienced engineer and records kept of these inspections and maintenance.

i. Stability and seepage analyses should be performed by a professional engineer experienced in the design and construction of dams.

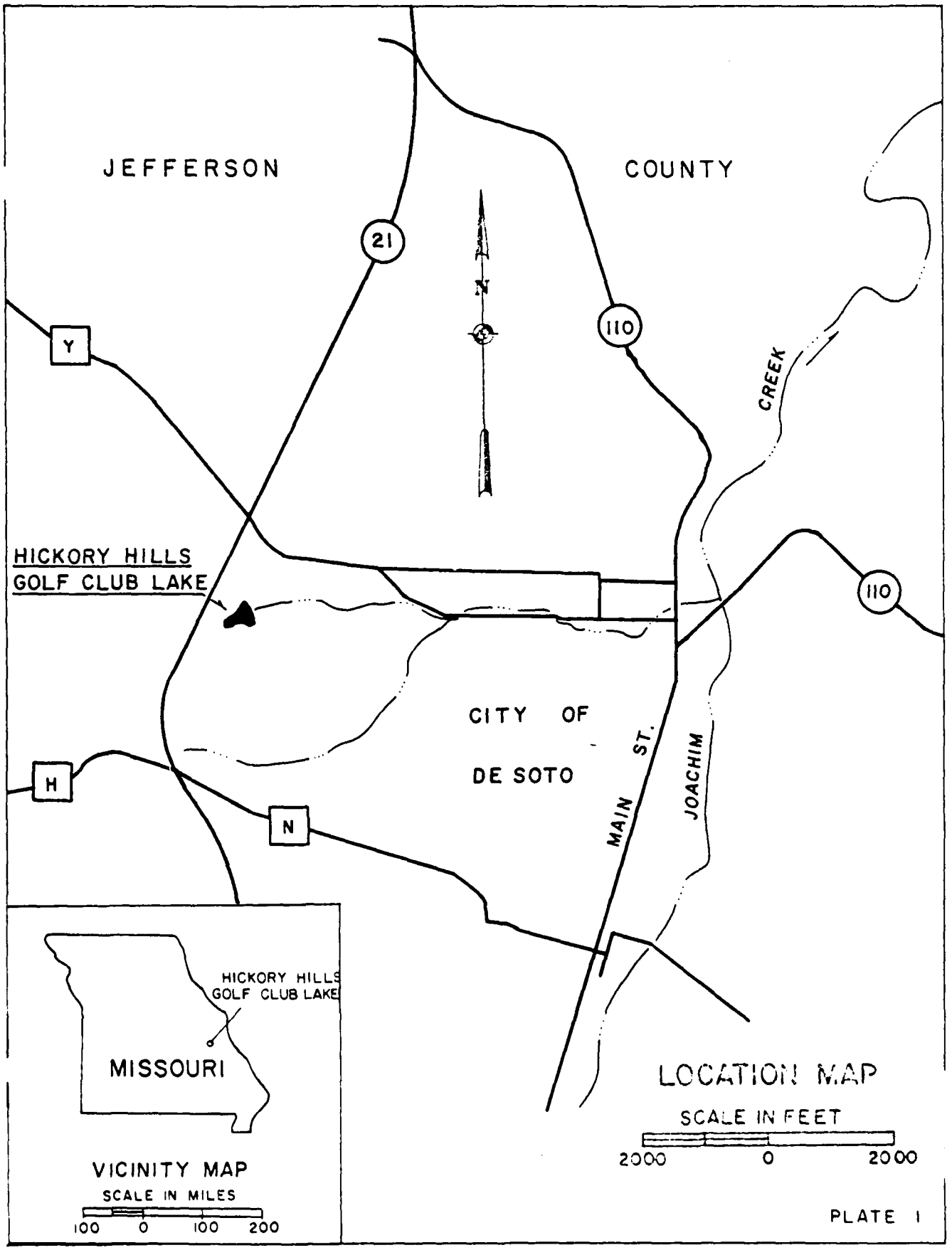
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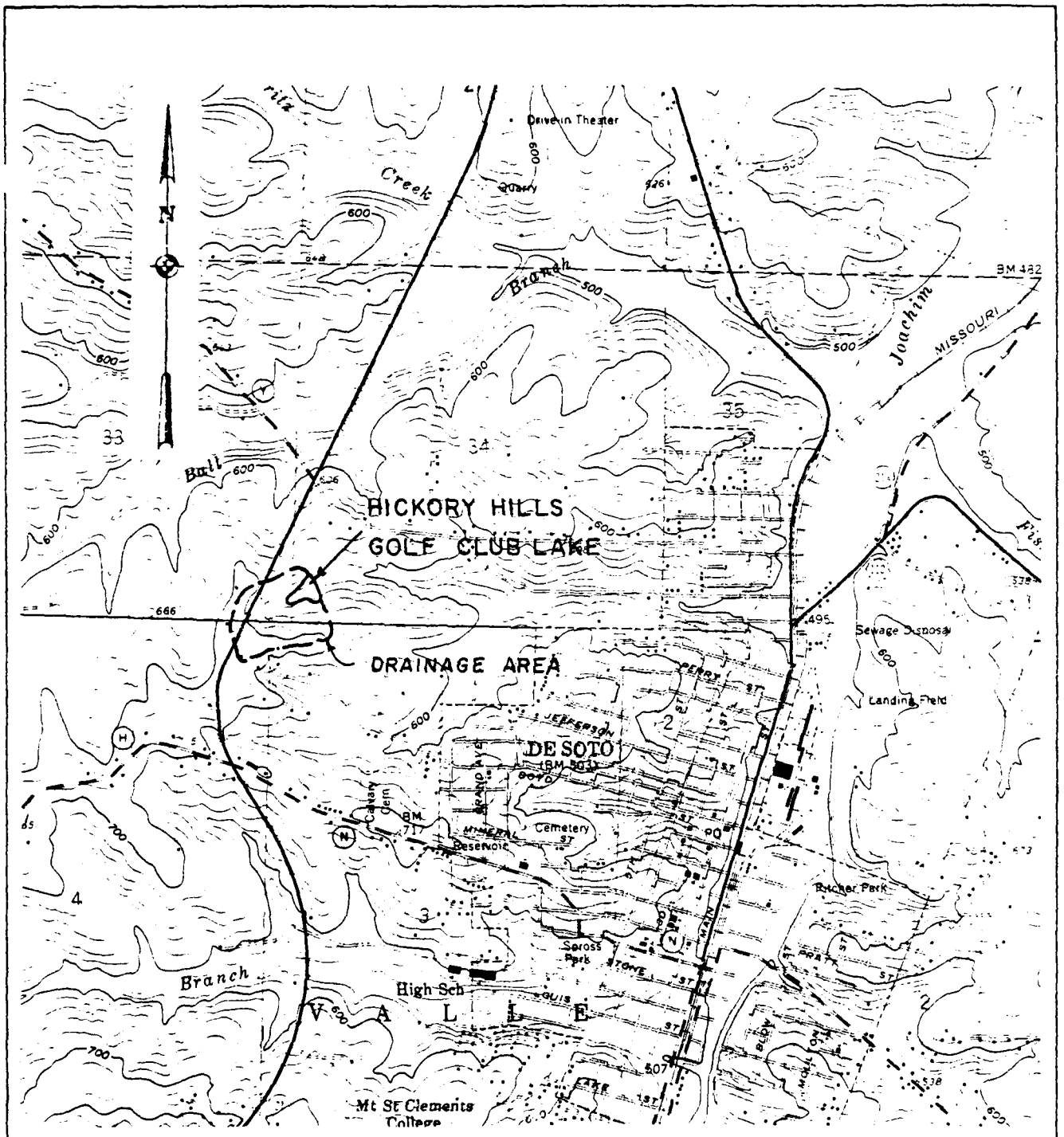
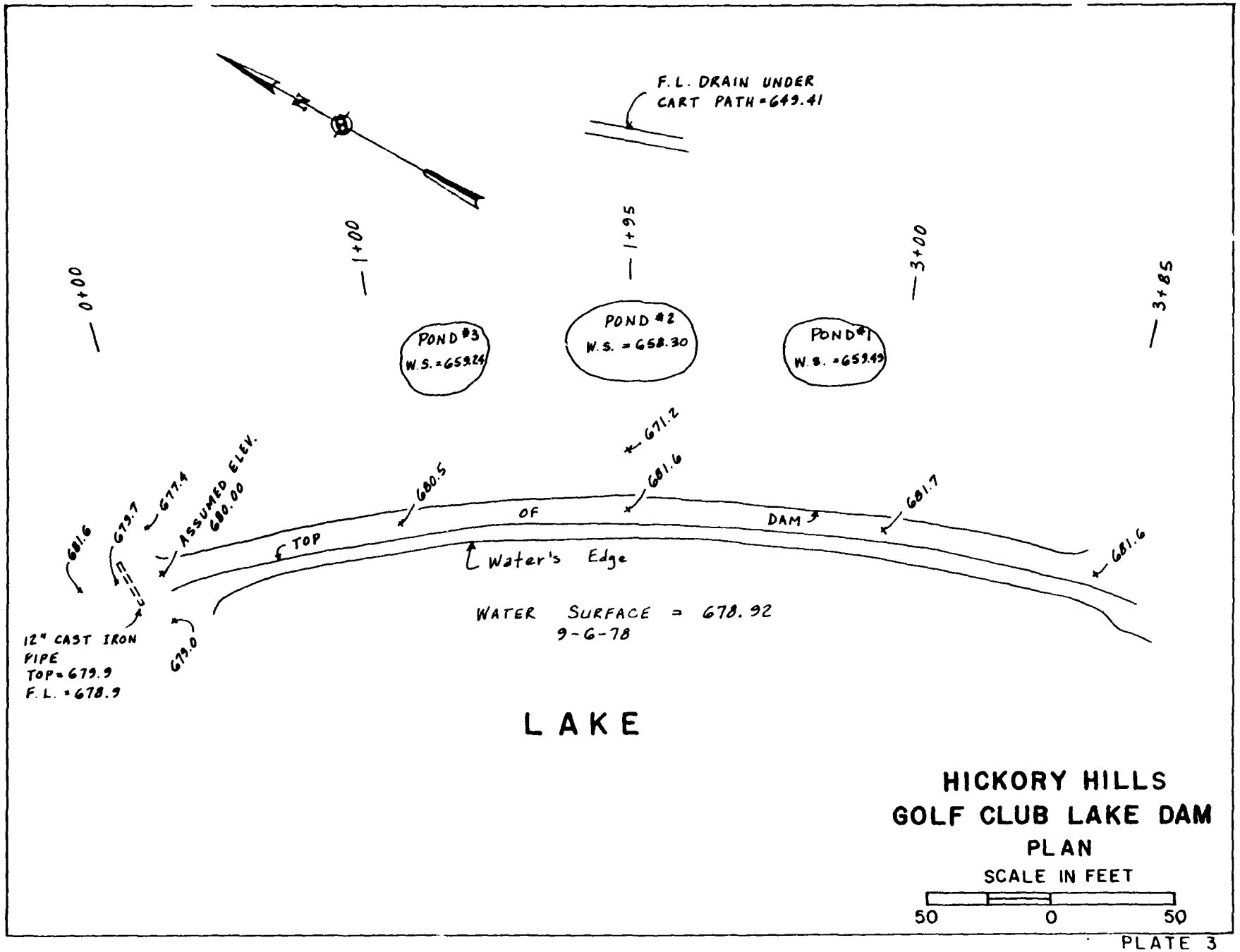
PLATE 1



HICKORY HILLS
GOLF CLUB LAKE
VICINITY TOPOGRAPHY
PLATE 2



HICKORY HILLS GOLF CLUB LAKE DAM

PLAN

SCALE IN FEET

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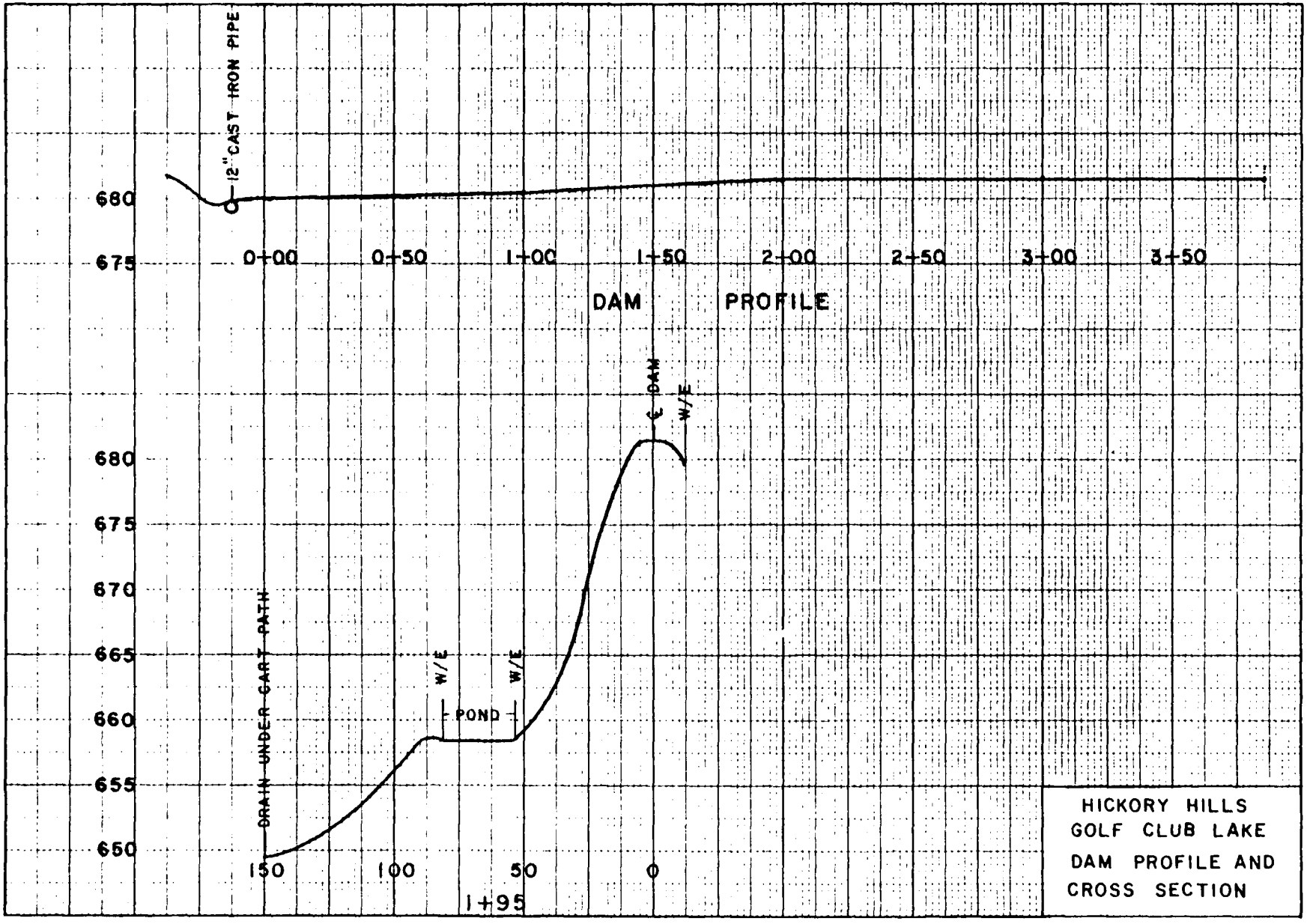
PLATE 3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100
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0
1+95
HICKORY HILLS
GOLF CLUB LAKE
DAM PROFILE AND
CROSS SECTION

PLATE 4

PHOTO No. 1 Hickory Hills Country Club Dam - Marsh area and Sewage Lagoon (Dam at left)

PHOTO No. 2 Hickory Hills Country Club Dam - Dam from Left Abutment

PHOTO No. 3 Hickory Hills Country Club Dam - Downstream Lagoon, Dam in Rear

PHOTO No. 4 Hickory Hills Country Club Dam - Downstream toe; Dam in Background

PHOTO No. 5 Hickory Hills Country Club Dam - Spillway

PHOTO No. 6 Hickory Hills Country Club Dam - Spillway and Dam

PHOTO NO. 7 Hickory Hills Country Club Dam - Dam Crown

APPENDIX A

HYDROLOGIC AND HYDRAULIC ANALYSIS METHODOLOGY

HYDROLOGIC AND HYDRAULIC ANALYSIS METHODOLOGY

1. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for a reservoir routing. The Probable Maximum Precipitation is derived and determined from regional charts prepared by the National Weather Service in "Hydrometeorological Report No. 33." Reduction factors have not been applied. A 24-hour storm duration is assumed with the total rainfall depth distributed over 6-hour periods in accordance with procedures outlined in EM 1110-2-1411 (SPF Determination). The maximum 6-hour rainfall period is then distributed to hourly increments by the same criteria. Within-the-hour distribution is based upon NOAA Technical Memorandum NWS HYDRO-35. The non-peak 6-hour rainfall periods are distributed uniformly. All distributed values are arranged in a critical sequence by the SPF criteria. The final inflow hydrograph is produced by deduction of infiltration losses appropriate to the soil, land use, and antecedent moisture conditions.

2. The reservoir routing is accomplished by using Modified Puls routing techniques wherein the flood hydrograph is routed through lake storage. Hydraulic capacities of the outlet works, spillway, and crest of dam are used as outlet controls in the routing. Storage in the pool area is defined by an elevation-storage capacity curve. The hydraulic capacity of the outlet works, spillway, and top of dam are defined by elevation-discharge curves.

3. Dam overtopping analysis has been conducted by hydrologic methods for this dam and lake. This computation determines the percentage of the PMF hydrograph that the reservoir can contain without the dam being overtopped. An output summary in the hydrologic appendix displays this information as well as other characteristics of the simulated dam overtopping.

4. The above methodology has been accomplished for this report using the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. The numeric parameters estimated for this site are listed in the attached computer printout. Definitions of these variables are contained in the "User's Manual" for the computer program.

5. The inflow hydrograph was routed through the reservoir using HEC-1's Modified Puls option. Releases were calculated for: 1) the horizontal overflow pipe assuming the pipe was flowing full; and 2) the spillway and dam not including flow through the 12-inch CIP. Finally, both releases were combined at each of their respective elevations.

Flow through the pipe was obtained using a hydraulic design chart selected from the U. S. Department of Transportation, FHA, "Hydraulic Charts for the Selection of Highway Culverts," prepared by Lester A. Herr. Assumed information was:

D = 12 inches

$HW/_D$ = 1.0

Scale (1)

Q determined was 2.4 cfs.

Flow over the spillway and dam was calculated using the weir flow equation:

Q = CLH 1.5

where: C = 3.0

L = Length in feet (varies with water surface)

H = Head of water in feet (varies with water surface)

Q = Discharge in cfs

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A        DAM INSPECTION PROGRAM - ZAPP78 - PAT - 10-81
A        TO PART LAKE #235 - SCS HYDROGRAPHS - 5 MINUTE INTERVALS
A        PROBABLE MAXIMUM FLOOD
B     288                  5                                          0       -5
J1       1         9         1
J2    .10      .20       .25       .30       .35       .40       .45       .50      1.0
K        0         1                                      5         1
K1       INFLOW HYDROGRAPH COMPUTATION
M        1         2      .04                             1.0                        1
P        0      26.0       102       120       130
T                                                                 -1       -91
U2              .066
X        0      -.10       3.0
Y        1         2                                      3         1
Z          RESERVOIR ROUTING BY MODIFIED PULS
Y                                        1         1
Y1       1                                                -678.9       -1
Y4   676.9     679.9       680     680.5       681     681.5     681.6
Y5       0       4.3      12.3       260     776.1      1619    1825.2
YA       0      2.77      3.67      9.18     11.94     15.61
YE   658.3     671.9       690       700       710       720
YS   678.9
YD     680
Z      99
A
A
A
A
A
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E>
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COMPUTER INPUT DATA

P *

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	678.90	678.90	680.00
STORAGE	19.	19.	22.
OUTFLOW	0.	0.	12.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	680.05	.05	22.	39.	.50	15.75	0.00
.20	680.20	.20	23.	113.	4.00	15.67	0.00
.25	680.26	.26	23.	141.	4.92	15.67	0.00
.30	680.32	.32	23.	169.	5.50	15.67	0.00
.35	680.37	.37	23.	197.	5.92	15.67	0.00
.40	680.43	.43	23.	225.	6.33	15.67	0.00
.45	680.49	.49	23.	253.	6.58	15.67	0.00
.50	680.55	.55	23.	282.	6.75	15.67	0.00
1.00	680.84	.84	24.	606.	11.08	15.67	0.00

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*********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  29 AUG 78
 *********************************
*01.
I>
*ed.
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COMPUTER SUMMARY ANALYSIS

INPUT UNIT HYDROGRAPH

REGRESSION DATA

SLOPE= 0.00 INTCP= -.10 RTIOP= 3.00

TIME INCREMENT FOR LAGGL--(300 IS 01 LAG77)

UNIT HYDROGRAPH 6 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .07 VOL= 1.00

199. 110. 30. 8. 2. 1.

0 EQ.DA	PE.PE	PERIOD	RAIN	EXCS	LOSS	COMP C	END-OF-PERIOD FLOW EQ.DA	PE.PE	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	0.00	.01	0.	1.01	12.05	145	.22	.22	.00	44.
1.01	.10	2	.01	0.00	.01	0.	1.01	12.10	146	.22	.22	.00	61.
1.01	.15	3	.01	0.00	.01	0.	1.01	12.15	147	.22	.22	.00	65.
1.01	.20	4	.01	0.00	.01	0.	1.01	12.20	148	.22	.22	.00	67.
1.01	.25	5	.01	0.00	.01	0.	1.01	12.25	149	.22	.22	.00	67.
1.01	.30	6	.01	0.00	.01	0.	1.01	12.30	150	.22	.22	.00	67.
1.01	.35	7	.01	0.00	.01	0.	1.01	12.35	151	.22	.22	.00	67.
1.01	.40	8	.01	0.00	.01	0.	1.01	12.40	152	.22	.22	.00	67.
1.01	.45	9	.01	0.00	.01	0.	1.01	12.45	153	.22	.22	.00	67.
1.01	.50	10	.01	0.00	.01	0.	1.01	12.50	154	.22	.22	.00	67.
1.01	.55	11	.01	0.00	.01	0.	1.01	12.55	155	.22	.22	.00	66.
1.01	1.00	12	.01	0.00	.01	0.	1.01	13.00	156	.22	.22	.00	66.
1.01	1.05	13	.01	0.00	.01	0.	1.01	13.05	157	.27	.26	.00	75.
1.01	1.10	14	.01	.00	.01	0.	1.01	13.10	158	.27	.26	.00	79.
1.01	1.15	15	.01	.00	.01	0.	1.01	13.15	159	.27	.26	.00	81.
1.01	1.20	16	.01	.00	.01	0.	1.01	13.20	160	.27	.26	.00	81.
1.01	1.25	17	.01	.00	.01	0.	1.01	13.25	161	.27	.26	.00	81.
1.01	1.30	18	.01	.00	.01	0.	1.01	13.30	162	.27	.26	.00	81.
1.01	1.35	19	.01	.00	.01	0.	1.01	13.35	163	.27	.26	.00	81.
1.01	1.40	20	.01	.00	.01	1.	1.01	13.40	164	.27	.26	.00	81.
1.01	1.45	21	.01	.00	.01	1.	1.01	13.45	165	.27	.26	.00	81.
1.01	1.50	22	.01	.00	.01	1.	1.01	13.50	166	.27	.26	.00	81.
1.01	1.55	23	.01	.00	.01	1.	1.01	13.55	167	.27	.26	.00	82.
1.01	2.00	24	.01	.00	.01	1.	1.01	14.00	168	.27	.26	.00	82.
1.01	2.05	25	.01	.00	.01	1.	1.01	14.05	169	.33	.33	.00	92.
1.01	2.10	26	.01	.00	.01	1.	1.01	14.10	170	.33	.33	.00	99.
1.01	2.15	27	.01	.00	.01	1.	1.01	14.15	171	.33	.33	.00	101.
1.01	2.20	28	.01	.00	.01	1.	1.01	14.20	172	.33	.33	.00	102.
1.01	2.25	29	.01	.00	.01	1.	1.01	14.25	173	.33	.33	.00	102.
1.01	2.30	30	.01	.00	.01	1.	1.01	14.30	174	.33	.33	.00	102.
1.01	2.35	31	.01	.01	.01	2.	1.01	14.35	175	.33	.33	.00	102.
1.01	2.40	32	.01	.01	.01	2.	1.01	14.40	176	.33	.33	.00	102.
1.01	2.45	33	.01	.01	.01	2.	1.01	14.45	177	.33	.33	.00	102.
1.01	2.50	34	.01	.01	.01	2.	1.01	14.50	178	.33	.33	.00	102.
1.01	2.55	35	.01	.01	.01	2.	1.01	14.55	179	.33	.33	.00	102.
1.01	3.00	36	.01	.01	.01	2.	1.01	15.00	180	.33	.33	.00	102.
1.01	3.05	37	.01	.01	.01	2.	1.01	15.05	181	.20	.20	.00	62.
1.01	3.10	38	.01	.01	.01	2.	1.01	15.10	182	.60	.60	.00	99.
1.01	3.15	39	.01	.01	.01	2.	1.01	15.15	183	.60	.60	.00	118.
1.01	3.20	40	.01	.01	.01	2.	1.01	15.20	184	.60	.60	.00	134.
1.01	3.25	41	.01	.01	.01	2.	1.01	15.25	185	.71	.70	.00	146.
1.01	3.30	42	.01	.01	.01	2.	1.01	15.30	186	1.71	1.71	.01	371.
1.01	3.35	43	.01	.01	.01	2.	1.01	15.35	187	2.82	2.82	.01	661.
1.01	3.40	44	.01	.01	.01	2.	1.01	15.40	188	1.11	1.11	.00	953.
1.01	3.45	45	.01	.01	.01	2.	1.01	15.45	189	.71	.70	.00	1.0e+
1.01	3.50	46	.01	.01	.01	2.	1.01	15.50	190	.60	.60	.00	234.
1.01	3.55	47	.01	.01	.01	2.	1.01	15.55	191	.40	.40	.00	168.

1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.01	8.30	102	.07	.06	.00	19.	1.01	20.30	246	.02	.02	.00	7.
1.01	8.35	103	.07	.06	.00	19.	1.01	20.35	247	.02	.02	.00	7.
1.01	8.40	104	.07	.06	.00	19.	1.01	20.40	248	.02	.02	.00	7.
1.01	8.45	105	.07	.06	.00	19.	1.01	20.45	249	.02	.02	.00	7.
1.01	8.50	106	.07	.06	.00	19.	1.01	20.50	250	.02	.02	.00	7.
1.01	8.55	107	.07	.06	.00	19.	1.01	20.55	251	.02	.02	.00	7.
1.01	9.00	108	.07	.06	.00	19.	1.01	21.00	252	.02	.02	.00	7.
1.01	9.05	109	.07	.06	.00	19.	1.01	21.05	253	.02	.02	.00	7.
1.01	9.10	110	.07	.06	.00	19.	1.01	21.10	254	.02	.02	.00	7.
1.01	9.15	111	.07	.06	.00	19.	1.01	21.15	255	.02	.02	.00	7.
1.01	9.20	112	.07	.06	.00	19.	1.01	21.20	256	.02	.02	.00	7.
1.01	9.25	113	.07	.06	.00	19.	1.01	21.25	257	.02	.02	.00	7.
1.01	9.30	114	.07	.06	.00	19.	1.01	21.30	258	.02	.02	.00	7.
1.01	9.35	115	.07	.06	.00	19.	1.01	21.35	259	.02	.02	.00	7.
1.01	9.40	116	.07	.06	.00	19.	1.01	21.40	260	.02	.02	.00	7.
1.01	9.45	117	.07	.06	.00	19.	1.01	21.45	261	.02	.02	.00	7.
1.01	9.50	118	.07	.06	.00	19.	1.01	21.50	262	.02	.02	.00	7.
1.01	9.55	119	.07	.06	.00	19.	1.01	21.55	263	.02	.02	.00	7.
1.01	10.00	120	.07	.06	.00	19.	1.01	22.00	264	.02	.02	.00	7.
1.01	10.05	121	.07	.06	.00	19.	1.01	22.05	265	.02	.02	.00	7.
1.01	10.10	122	.07	.06	.00	19.	1.01	22.10	266	.02	.02	.00	7.
1.01	10.15	123	.07	.06	.00	19.	1.01	22.15	267	.02	.02	.00	7.
1.01	10.20	124	.07	.06	.00	19.	1.01	22.20	268	.02	.02	.00	7.
1.01	10.25	125	.07	.06	.00	19.	1.01	22.25	269	.02	.02	.00	7.
1.01	10.30	126	.07	.06	.00	19.	1.01	22.30	270	.02	.02	.00	7.
1.01	10.35	127	.07	.06	.00	19.	1.01	22.35	271	.02	.02	.00	7.
1.01	10.40	128	.07	.06	.00	19.	1.01	22.40	272	.02	.02	.00	7.
1.01	10.45	129	.07	.06	.00	19.	1.01	22.45	273	.02	.02	.00	7.
1.01	10.50	130	.07	.06	.00	19.	1.01	22.50	274	.02	.02	.00	7.
1.01	10.55	131	.07	.06	.00	19.	1.01	22.55	275	.02	.02	.00	7.
1.01	11.00	132	.07	.06	.00	20.	1.01	23.00	276	.02	.02	.00	7.
1.01	11.05	133	.07	.06	.00	20.	1.01	23.05	277	.02	.02	.00	7.
1.01	11.10	134	.07	.06	.00	20.	1.01	23.10	278	.02	.02	.00	7.
1.01	11.15	135	.07	.06	.00	20.	1.01	23.15	279	.02	.02	.00	7.
1.01	11.20	136	.07	.06	.00	20.	1.01	23.20	280	.02	.02	.00	7.
1.01	11.25	137	.07	.06	.00	20.	1.01	23.25	281	.02	.02	.00	7.
1.01	11.30	138	.07	.06	.00	20.	1.01	23.30	282	.02	.02	.00	7.
1.01	11.35	139	.07	.06	.00	20.	1.01	23.35	283	.02	.02	.00	7.
1.01	11.40	140	.07	.06	.00	20.	1.01	23.40	284	.02	.02	.00	7.
1.01	11.45	141	.07	.06	.00	20.	1.01	23.45	285	.02	.02	.00	7.
1.01	11.50	142	.07	.06	.00	20.	1.01	23.50	286	.02	.02	.00	7.
1.01	11.55	143	.07	.06	.00	20.	1.01	23.55	287	.02	.02	.00	7.
1.01	12.00	144	.07	.06	.00	20.	1.02	0.00	288	.02	.02	.00	7.

SUM	33.80	32.64	1.16	10456.
	(859.)	(829.)	(29.)	(296.0*)

	PEAK	6-POPP	24-POPP	72-POPP	TOTAL VOLUME
CFS	661.	113.	30.	36.	1049*.
CMS	19.	3.	1.	1.	296.
INCHES		26.33	33.72	33.72	33.72
		668.66	856.47	856.47	856.47
AC-FT		56.	72.	72.	72.
PCNT CLRP		69.	[illegible]	[illegible]	19.

[illegible] AT 537 1.01 PLAN 1, PTIO 1


ATE
LME